

NIH Program Evaluation Report An Analysis of Research Publications Supported by NIH 1970-1976

NIH and NHLBI

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NIH PROGRAM EVALUATION REPORT

Analysis of Research Publications
Supported by

NIH and NHLBI

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Analysis of Research Publications
Supported by
The National Institutes of Health
1970 - 1976

National Heart, Lung, and Blood Institute

INTRODUCTION

This report presents an analytic characterization of 1970-1976 research publications supported by the National Heart, Lung, and Blood Institute. A parallel report has been prepared for each of the National Institutes of Health (except NIA and NIEHS for which sufficient data were not available). Since 1973, CHI Research (the research group at Computer Horizons Inc.) has worked under contract to NIH (N01-OD-2109) on the development and application of indicators of biomedical research activity. These reports are an outgrowth of this collaborative association.

Although publication analyses were first used to assess scientific activity at least 50 years ago, it is only in the past decade that the availability of economical large scale computer capabilities has made wide scale application feasible. "Bibliometrics," as this growing assortment of tools of analysis has come to be known, is based on the assumption that quantitative analyses of scientific journal papers, and of the citations later received by these papers, can provide sensitive indicators of activity and change in scientific productivity. The NIH - CHI research collaboration over the past several years, and related NSF supported efforts, have resulted in extensive evidence of both the validity of the assumption and the utility of the tools that have been developed. A list of relevant reports and publications will be found in Appendix A. See also NSF's Science Indicators (18). Copies of reports and publications on the NIH work can be obtained from Dr. Francis Narin at CHI or from Dr. Helen H. Gee at NIH.

The present group of reports is intended to introduce to NIH Bureaus, Institutes and Divisions (B/I/Ds) a new set of tools for program review and evaluation. The reports are based on the 1970-1977 papers published in a selected set of 275 biomedical journals. In 1982, the reports will be updated through 1980. The 275 journals contain, overall, about 80 percent of the NIH supported research papers published during this period. Limitation of the analysis to this subset of journals has been dictated by the necessity of examining each paper individually to determine acknowledgement of source(s) of support. Beginning in 1981, greatly extended and refined analyses will be made possible by the inclusion of support acknowledgement information in the National Library of Medicine's MEDLINE system. A detailed guide to the use of the tables and graphs in this report will be found in the sections that follow.

B/I/D PUBLICATION DATA SET

Journal Selection

The publication and citation information contained in this report has been drawn from an analysis of some 600,000 papers published between 1970 and 1977 in 264 biomedical research journals. The publications attributed to a given Institute represent the combined production of Intramural research programs and Extramural grant and contract support acknowledgements.

The objectives that guided the selection of 264 journals in the B/I/D Data Set were to:

- Represent all biomedical research areas by their most influential (most often cited) biomedical journal papers, and to
- Cover as many of the papers supported by NIH as possible.

An original selection of 250 journals based on these criteria was increased to 264 in response to the recommendations of B/I/D and DRG Health Science Administrators.

Since 1973 when the journals were selected, many have split or subdivided so that by 1977 there were 275 journals in the group. If the journal supplements are counted separately, they number nearly 300. (See Appendix B.)

Representativeness of the B/I/D Journal Set

Adequacy of the coverage of the 275 journal set has been assessed principally by comparing the total number of BID supported publications found in these journals with the numbers reported in the NIH 1973 Research Grants Index and the NIH Directory - Bibliography for the same year. In making these comparisons, books, abstracts, and other inappropriate (for this purpose) items were deleted from the counts. Overall, approximately 80 percent of NIH supported papers appear in the selected group of 275 journals. The following tabulation shows the percent of the total number of BID papers listed in the source documents that were covered by the 275 journal set in 1973.

% of Reported NIH Supported Papers in B/I/D Journals

NCI	85%
NEI	76%
NHLBI	76%
NIAID	75%
NIAMDD	82%
NICHD	79%
NIDR	72%
NIGMS	82%
NINCDS	76%
DRR	76%

The adequacy of the journal set was also assessed by correlating the number of papers in each biomedical "subfield" in the B/I/D set with the number of U.S. papers in the same subfields in the over 900 biomedical journals in the Science Citation Index (SCI). Correlation of the two sets was .98.

Because the B/I/D data set includes some foreign papers there were two subfields (pharmacology and urology) for which there were more papers in the B/I/D set than for all the U.S. in the SCI set. For 35 other subfields the number of papers in the B/I/D journal set ranged from 60 to 90% of the number of all U.S. papers. Three subfields had no papers in the B/I/D journal set - Addictive Diseases, Miscellaneous Clinical Medicine and Microscopy. Nine other subfields for which the B/I/D counts were low, in the 20 to 60% range, are Miscellaneous Biomedical Research (25.1%), Biomedical Engineering (29.4%), Allergy (37.6%), Nephrology (39.6%), Genetics and Heredity (42.2%), Hygiene and Public Health (46.1%), Veterinary Medicine (53%), Fertility (56.7%), and Nutrition and Dietetics (57.5%). B/I/D data on these subfields should accordingly be interpreted with due caution. It should be noted, however, that a large majority of the papers that are not covered appear in journals that report primarily the results of clinical observations on small numbers of patients rather than formal research efforts.

Data Capture

Development of the B/I/D data set required that every paper published between 1970 and 1977 in each of the 275 journals be scanned to capture BID support acknowledgement information. (Beginning in January 1981, this information will be included in MEDLINE). Up to three research support acknowledgements were tabulated and added to the original listings drawn from the Science Citation Index (SCI). When more than one source of support was acknowledged, fractional credits were assigned. The resulting lists were then matched to SCI Corporate Tapes to obtain author institutional affiliations. Up to three author institutional affiliations were added to the data set. Finally, the entire data base was matched to MEDLINE. This match provides titles of papers, the names of all authors (only the first author is captured by SCI), and MeSH headings. The MEDLINE version of the data set does not include a few of the original journals, primarily chemistry journals, not covered by MEDLINE.

Citation Frequency

The number of times each paper in the data set was cited has been added to the data base, utilizing the SCI citation tapes for 1973 to 1977. In the citation matching, B/I/D, institutional identifications, and MEDLINE data have been retained for both referencing and cited author(s).

Subject and Level Classification

A classification system for the journals has been developed in which each journal has been assigned to one of 48 subfields. The 48 biomedical subfields are also collectively grouped into "clinical medicine" or "biomedical (basic) research." The journal classification thus permits characterization of each B/I/D's research support activity into journal defined traditional disciplines such as physiology, microbiology, immunology, pathology, etc.

Journals have also been assigned to a "research level." The level concept assumes the existence of a scale ranging from clinical observation (Level 1) to basic biological (Level 4) journals. The level designations and prototype journals around which the level definition was developed are as follows:

- Level 1 - Clinical Investigation. Prototype Journal:
Journal of the American Medical Association
- Level 2 - Clinical Mix. Prototype Journal:
New England Journal of Medicine
- Level 3 - Clinical Investigation. Prototype Journal:
Journal of Clinical Investigation
- Level 4 - Basic Research. Prototype Journal:
Journal of Biological Chemistry

The level classification permits consideration of B/I/D programs from an additional useful perspective. The classification system is described in greater detail in References 1 and 2. Additional clarification of the concept may be obtained by reviewing the level assignment of each of the journals in the BID Data Set (Appendix B).

NIH AND NHLBI PUBLICATION TRENDS

Figures 1-3 summarize overall trends in funding and publication for the NIH B/I/Ds for which adequate data are available (NCI, NEI, NHLBI, NIAID, NIAMDD, NICHD, NIDR, NIGMS, NINCDS, DRR).

Figure 1 depicts B/I/D obligations from 1965 through 1977, in 1969 dollars. Note that there was an overall peak in funding in 1968 - 1969, followed by a brief dip and a subsequent fairly steady rise. Most of the increased funding in the early 1970s was concentrated in NCI and NHLBI, though NEI also shows a steady increase in real obligations.

Figure 2 shows corresponding publication trends. The three Institutes showing the largest upward trends over the seven year period 1970-77, NCI, NHLBI, and NEI are also the three Institutes that had the largest increases in real dollar obligations as shown in Figure 1. Relative ranks of the B/I/Ds on these figures is also very similar, although differences in ratios of basic to clinical research supported could be expected to reduce the similarity.

Figure 3 presents data specifically for NHLBI papers, by biomedical research level. Between 1970 and 1977 the number of NHLBI biomedical papers in the 275 journal set increased by 31%, from approximately 1900 to approximately 2500. Increases are reflected at all research levels, with Level 4 (basic research) increasing most rapidly. In 1970, 31.2% of NHLBI supported biomedical papers appeared in Level 4 journals; in 1977, 38.6% were at Level 4. The trend toward heavier publication in Level 4, basic research journals continued rather steadily throughout the 1970-1977 time period.

FIGURE 1.--FUNDING FOR THE B/I/Ds

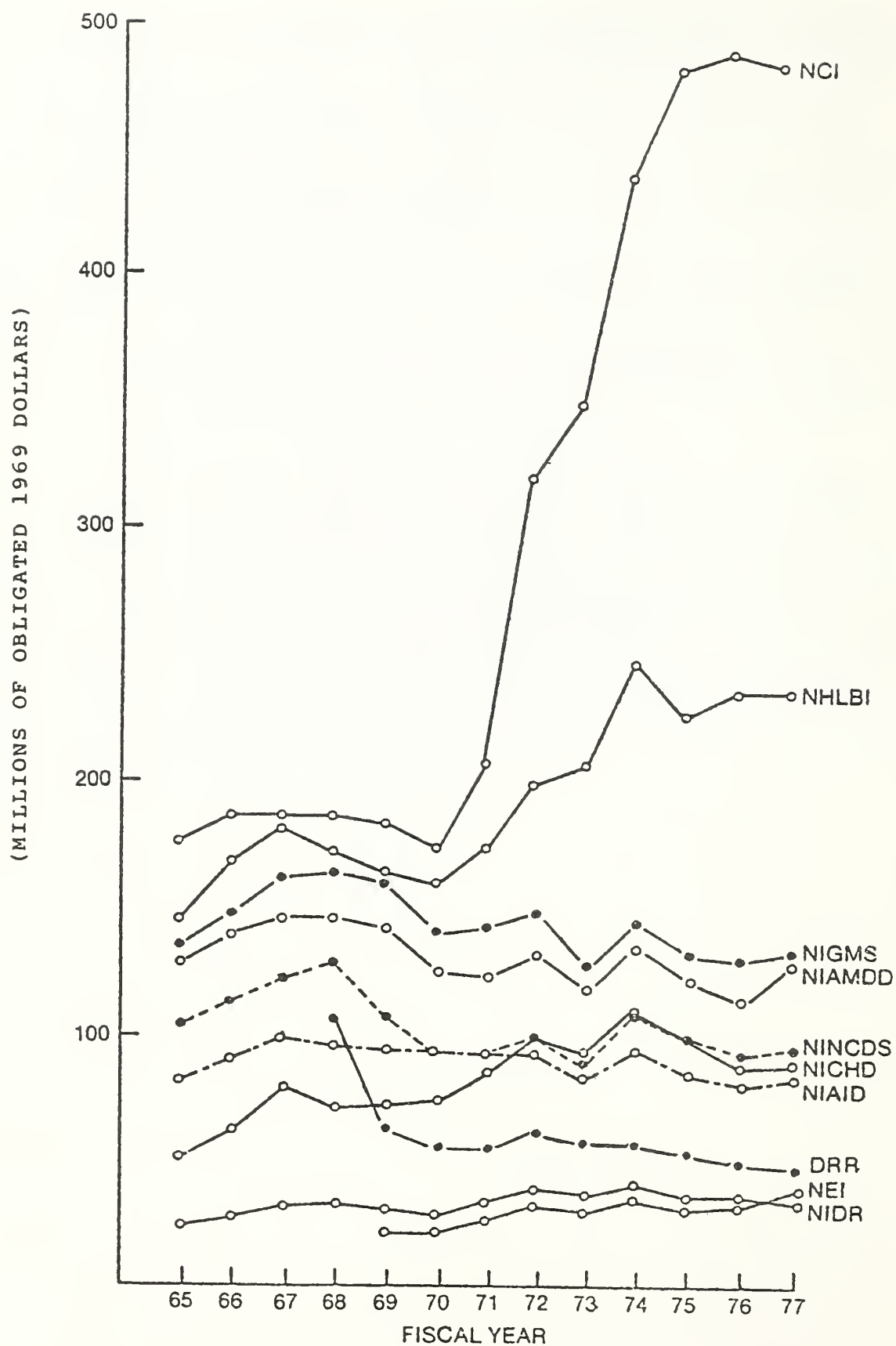
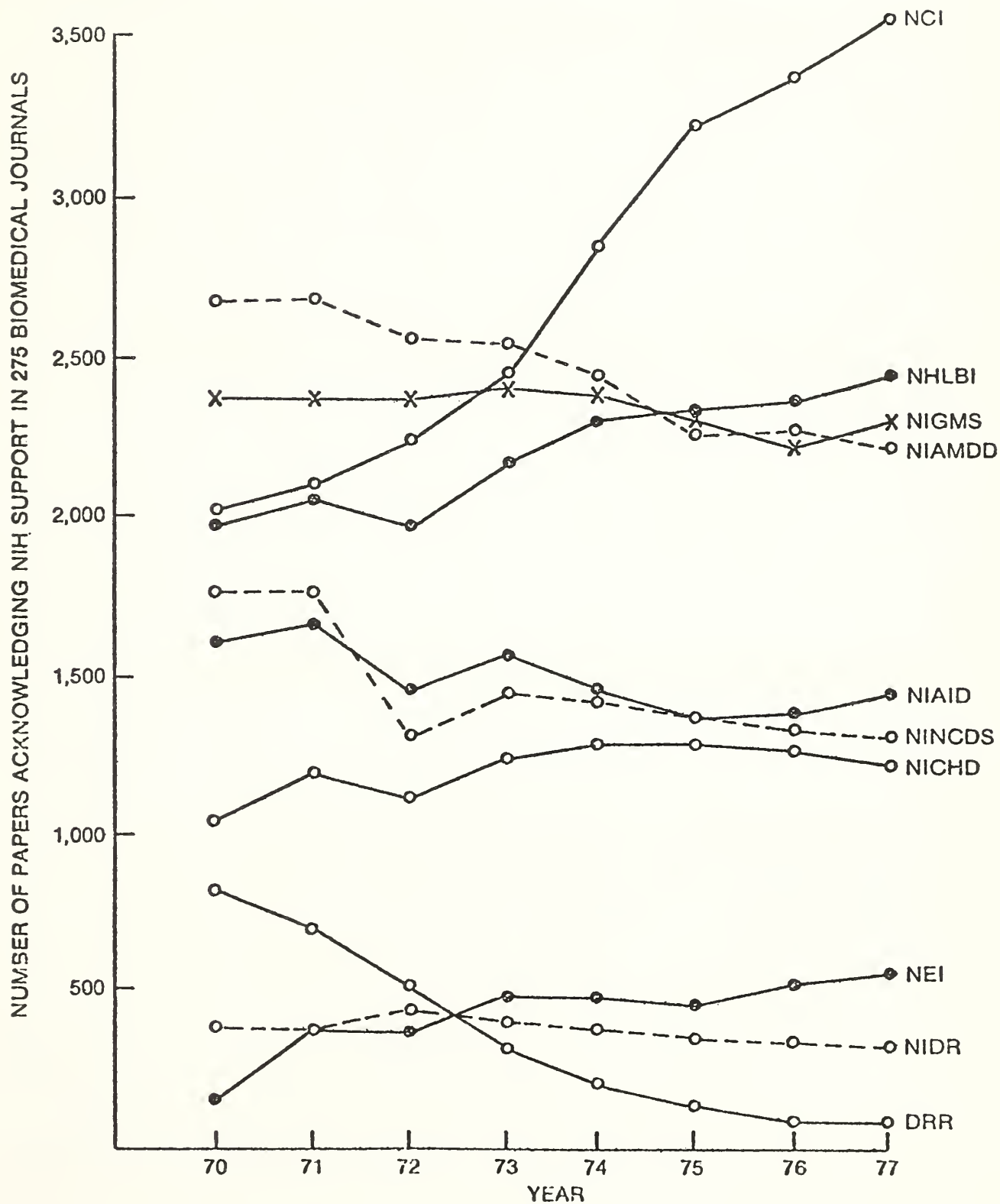


FIGURE 2.--ACKNOWLEDGEMENTS OF RESEARCH SUPPORT
APPEARING IN 275 SCIENTIFIC JOURNALS



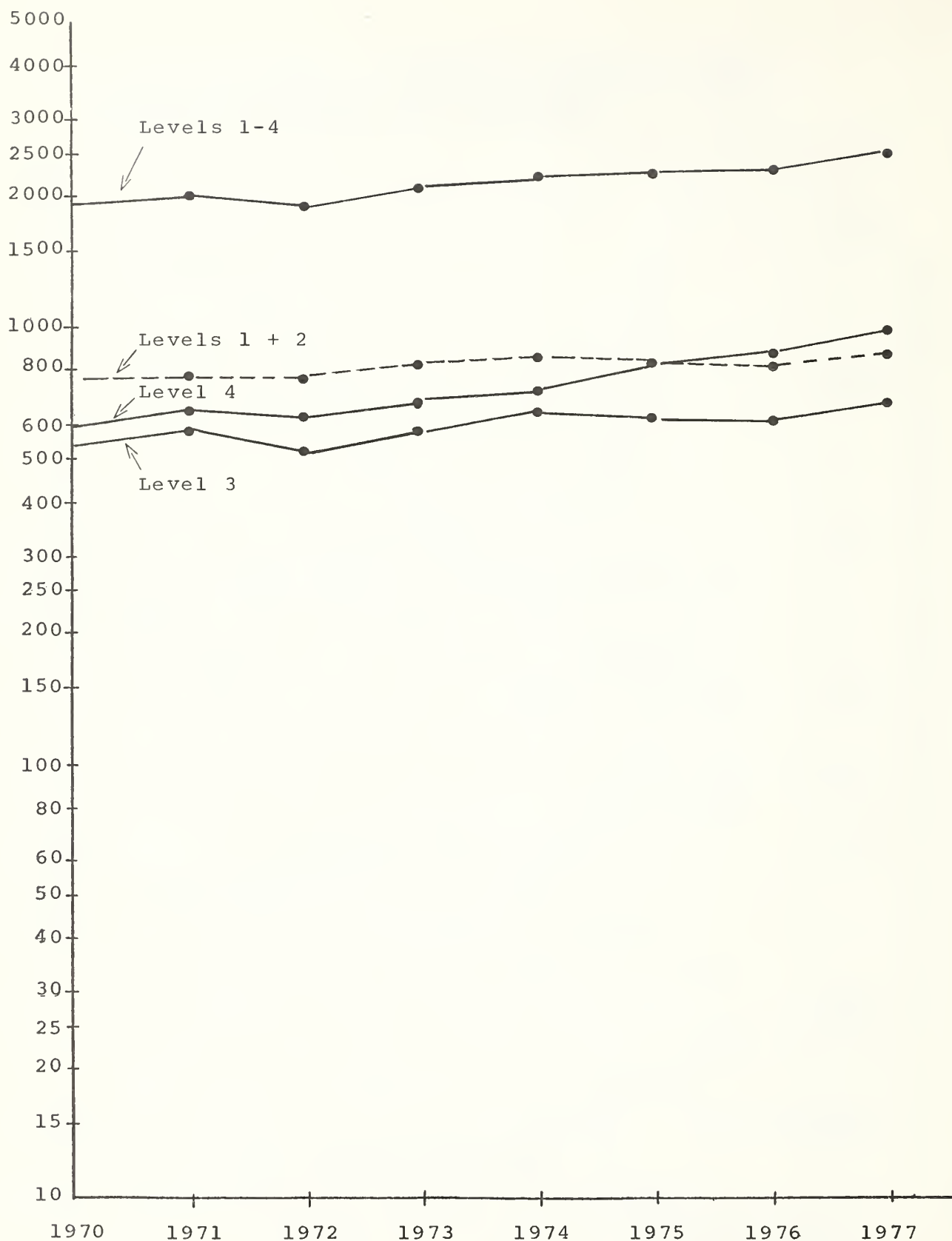


FIGURE 3: NHLBI SUPPORTED PAPERS IN BIOMEDICAL JOURNALS BY RESEARCH LEVEL (1977 data includes 7% estimate of 1977 papers on 1978 tapes)

NHLBI PUBLICATION ACTIVITY GRAPHS

The graphs in this section present a detailed bibliometric profile of NHLBI supported research in the 275 B/I/D journals. The publication data are summarized in Figures 4 and 5.

Figure 4 shows the percent of all U.S. papers in each of the listed scientific fields and subfields in the journal set that were supported by NHLBI and by NIH. The total NIH percent is shown by the open bar, and the NHLBI proportion by the solid bar. In the subfield of cardiovascular systems, for example, approximately 34% of the papers in the five representative cardiovascular systems journals are supported by NIH; 29% of the total are supported by NHLBI. Only 5% of the cardiovascular systems journal papers are supported by other B/I/Ds, but in other areas of special interest to NHLBI such as respiratory systems and hematology, larger proportions of the published papers are supported by other B/I/Ds; these results illustrate the broad dependency of biomedical disciplines on the NIH B/I/Ds.

Figure 5 shows the distribution of "Activity Indexes" for NHLBI. The Activity Index is a ratio determined by dividing the percent of an Institute's papers in a subfield by the percent of all journal papers in the subfield (as the subfields are defined in the 275 journal set). Thus, the graph displays the areas in which B/I/D activity is high or low relative to the national effort in a field. Note that the NHLBI index for cardiovascular systems journals is 9.46, indicating that NHLBI supported activity in this subfield is 9 times greater than would be expected based on the relative size of this field among all the fields represented by the 275 journals. Other fields in which the NHLBI activity is notably high are respiratory systems, physiology, biomedical engineering, hematology and pathology.

When activity graphs for all B/I/Ds are compared, a common pattern is apparent. Each Institute supports a high rate of activity in one or at most a few clinical fields that are clearly appropriate to its mission, and also supports a high rate of activity in a small number of relevant basic biomedical research fields.

FIGURE 4

NHLBI and NIH

% of All U.S. Papers in Each Scientific Field and Subfield Supported by the BID and by NIH

(1970-1976 combined, 275 Biomedical and Related Journals)

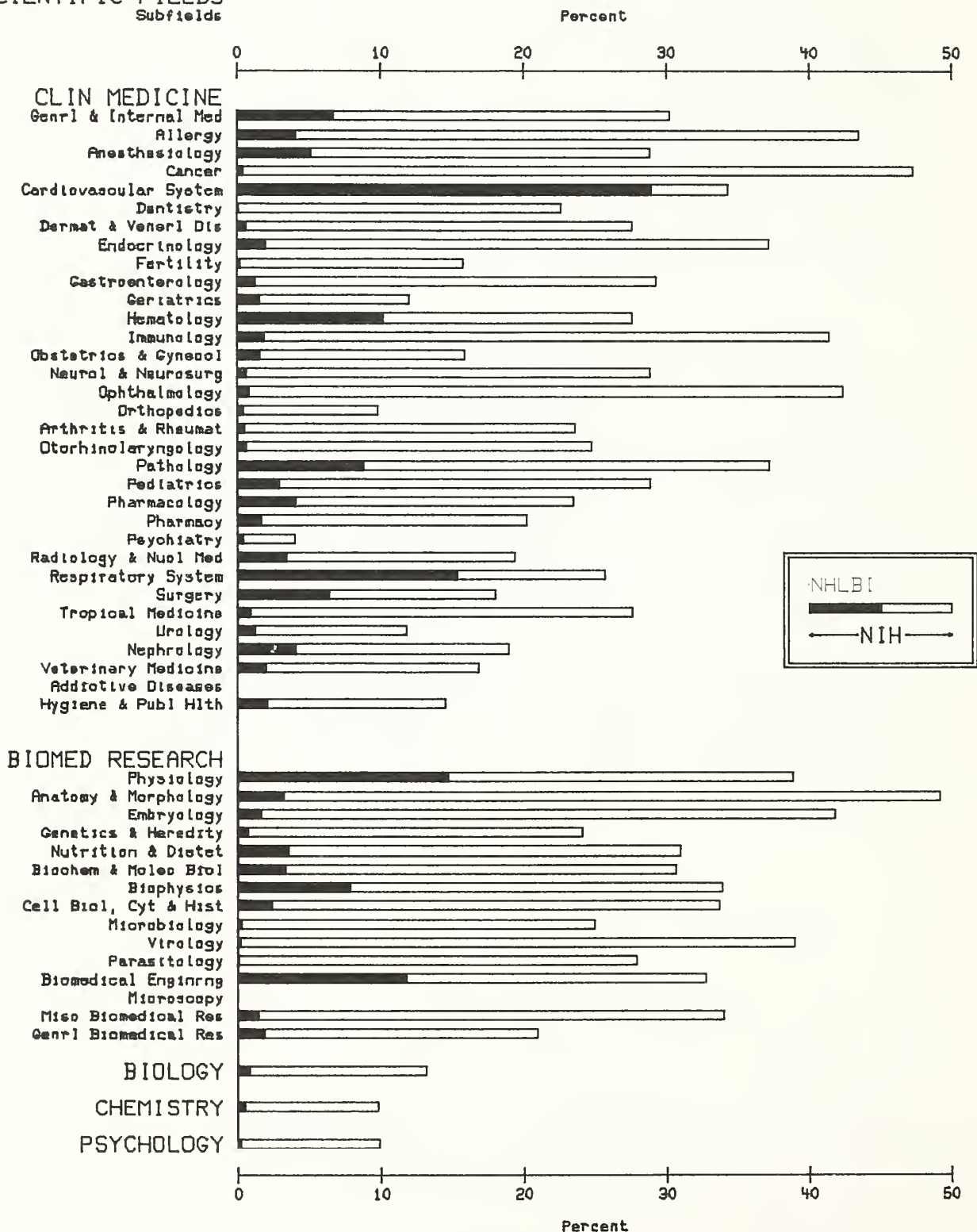
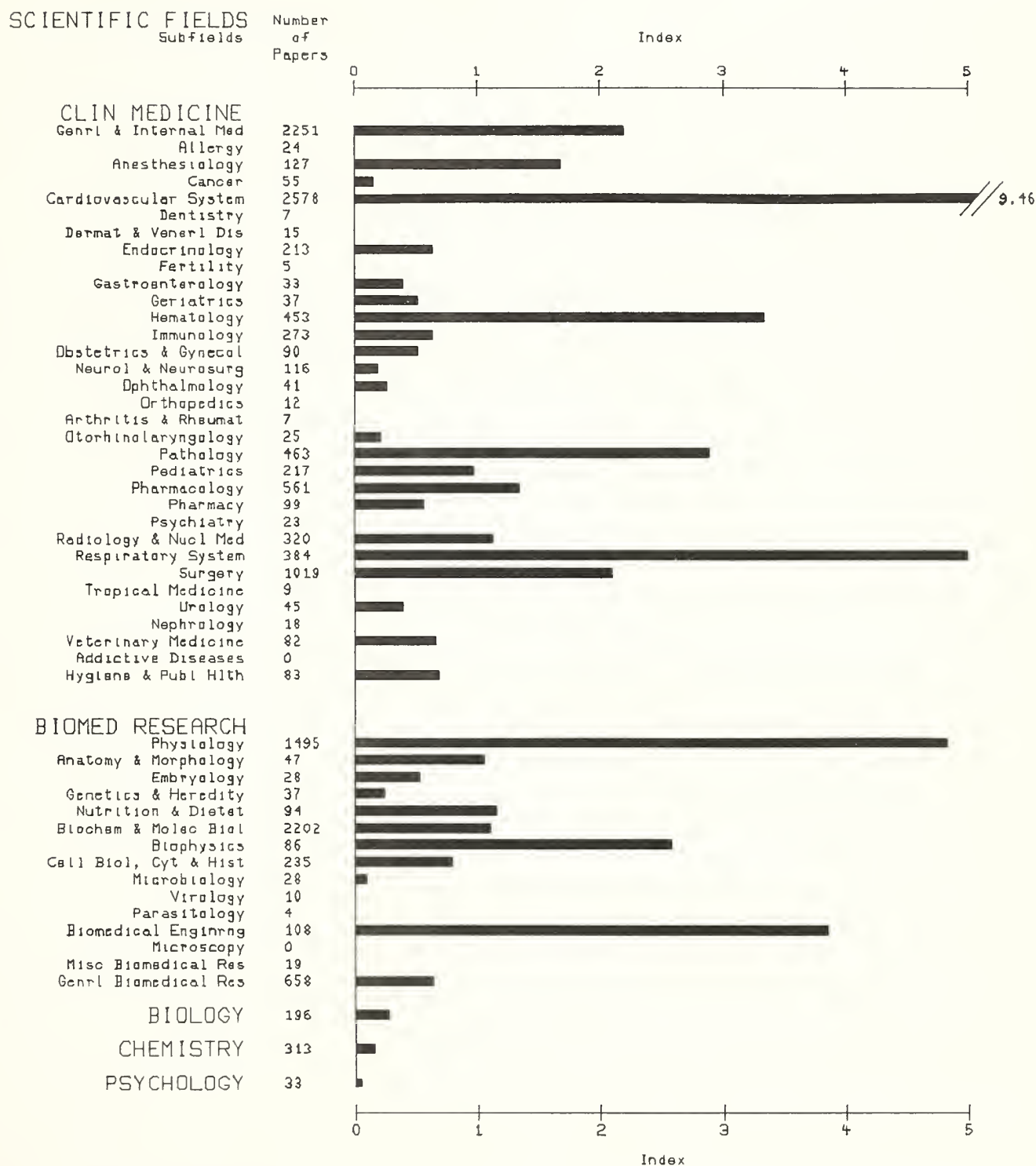
SCIENTIFIC FIELDS
Subfields

FIGURE 5 - NHLBI

Index of Concentration in Scientific Fields & Subfields (1970-1976 combined, 275 Biomedical and Related Journals)

$$\text{INDEX} = \frac{\% \text{ of Institute's Papers in Field}}{\% \text{ of 275 Journals' Papers in Field}}$$



NOTE: No values shown for Scientific Fields or Subfields in which BID supported fewer than 25 papers.

CITATION PERFORMANCE

For any collection of papers it is characteristic that the distribution of the number of citations received is extremely skewed. In general, relatively few papers in a field are very highly cited and relatively many are cited once or twice or not at all. Given these skewed distributions, measures of central tendency are of limited value in analysis. One alternative way of assessing citation impact is to compare the frequency of highly cited papers between groups.

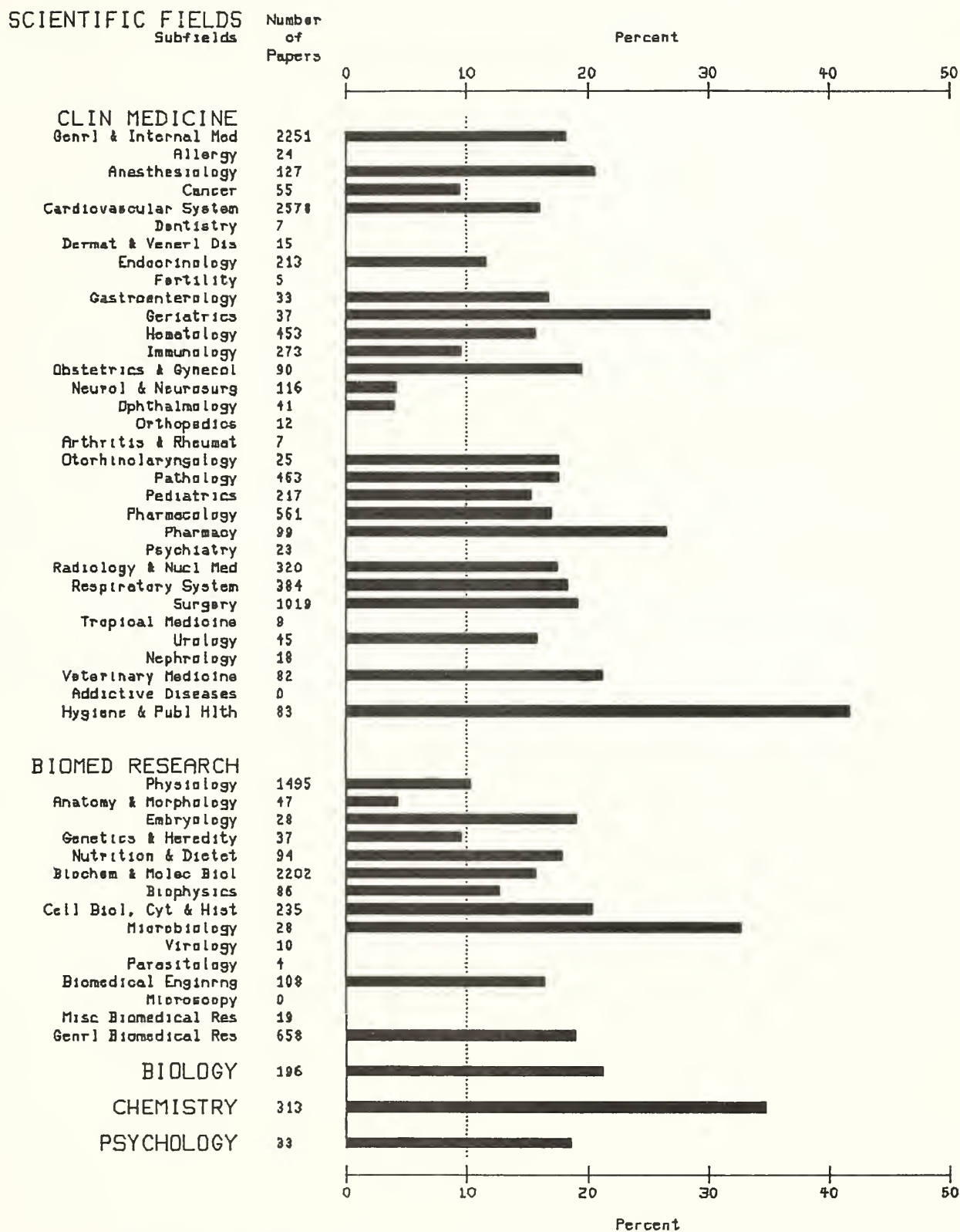
Figure 6 shows the percent of NHLBI supported papers that are in the top decile of cited papers in each subfield represented in the B/I/D journal set. This statistic has the advantage that a top decile is interpretable across both subfields and years even though the proportions are based on different numbers of citations in each cited year and in each subfield.

Graphic representations are limited arbitrarily to subfields in which the Institute supported more than 25 papers in the 1970-76 period. For NHLBI there are 34 such subfields. In 28 of the 34 subfields more than 10% of the NHLBI supported papers are in the top decile of cited papers, and in four of the 34 subfields more than 20% of the NHLBI papers are in the top decile. Reference to the column of T-score values for citations to NHLBI papers, given in Table 3, shows that, on the average, the frequency of citation for NHLBI papers is more than one-third of a standard deviation above the mean for all papers in the aggregated subfields.

FIGURE 6 - NHLBI

% of BID's Papers in the Top Decile of Cited Papers by Scientific Fields and Subfields

(1970-1976 combined, 275 Biomedical and Related Journals)



NOTE: No values shown for Scientific Fields or Subfields in which BID supported fewer than 25 papers.

B/I/D INTERDEPENDENCY

Another perspective on the bibliometric character of a B/I/D is provided by considering its referencing and citation interaction with other B/I/Ds.

Figure 7 is based on the references listed in NHLBI supported papers; it illustrates the dependence of NHLBI research on information supported by other sources. Only 32% of the references in NHLBI supported papers are to other NHLBI supported papers; 68% are to papers that were supported by others. The two other Institutes upon which NHLBI authors draw most heavily are NIAMDD and NIGMS, each cited in 5 to 7% of the NHLBI references. Altogether, only 15% of the NHLBI references are to papers supported by sources outside of the Federal government. The 17% of references to papers that give no support acknowledgements are likely to be to "clinical observation" papers, i.e., papers based on the observation by a physician in practice of notable experience with a small group of patients. Acknowledgements of support outside the Federal government are often the major societies and other private biomedical research support foundations, state and local governments, or private industry, such as the pharmaceutical companies.

Figure 8 presents the converse of Figure 7, showing the citations received by NHLBI supported papers, according to the referencing source. Some 33% of the citations received by NHLBI papers are from papers supported by NHLBI, while 67% are from papers with other sources of support.

The NIH Institutes which cite NHLBI papers frequently, accounting for 5-6% of NHLBI's citations, are NIAMDD and NIGMS, the same two Institutes that are cited frequently by NHLBI supported papers. NHLBI receives about 18% of its citations from papers that contain no support acknowledgements, and 16% from authors supported by other than Federal government sources.

FIGURE 7: REFERENCES GIVEN BY NHLBI SUPPORTED
PAPERS PUBLISHED IN 1973-1977 TO
U.S. PAPERS PUBLISHED IN 1970-1976

Note: Size of circle
proportional to #
supported papers -
one arrow for each
2% of references
(Actual % indicated)

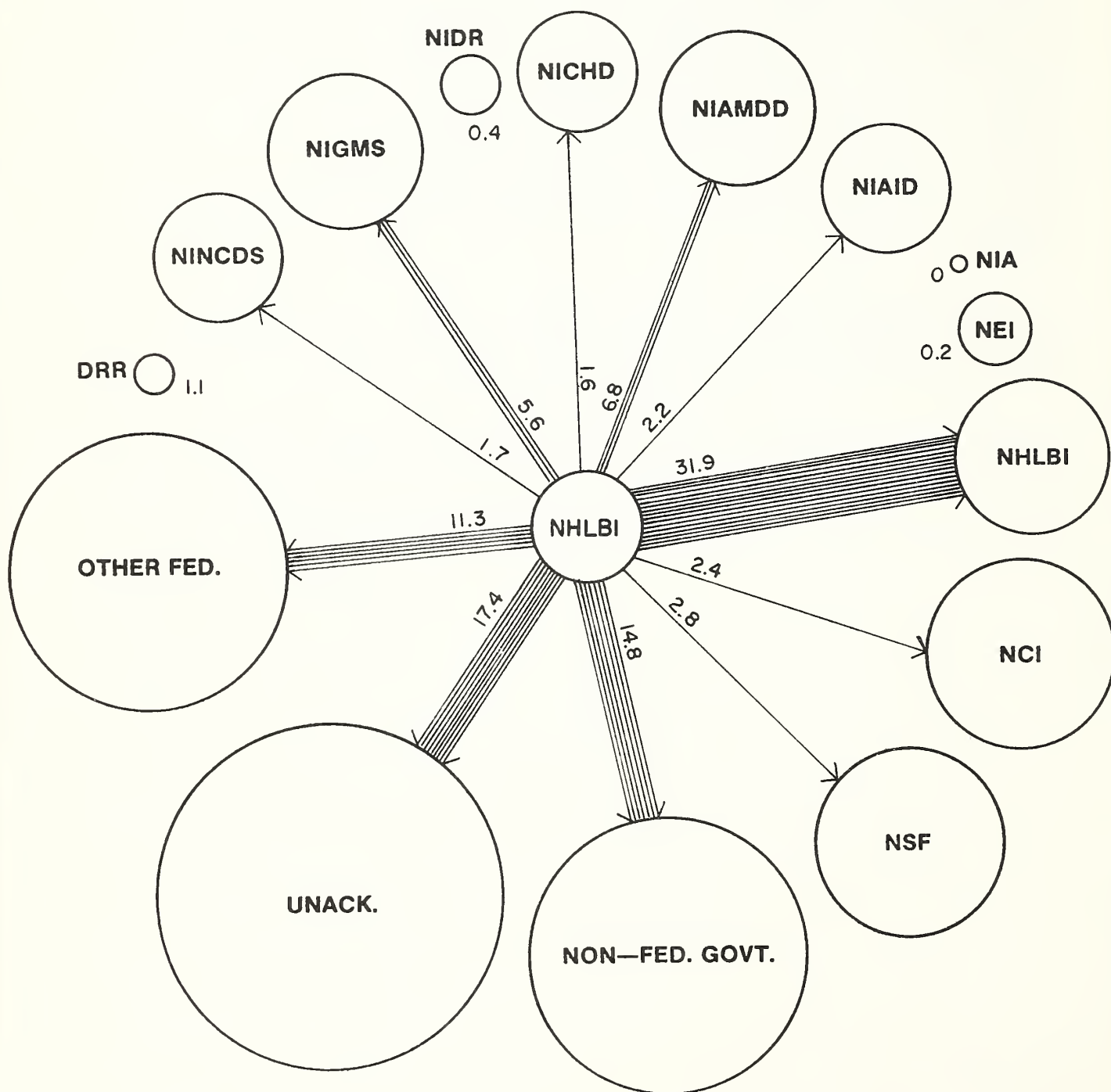
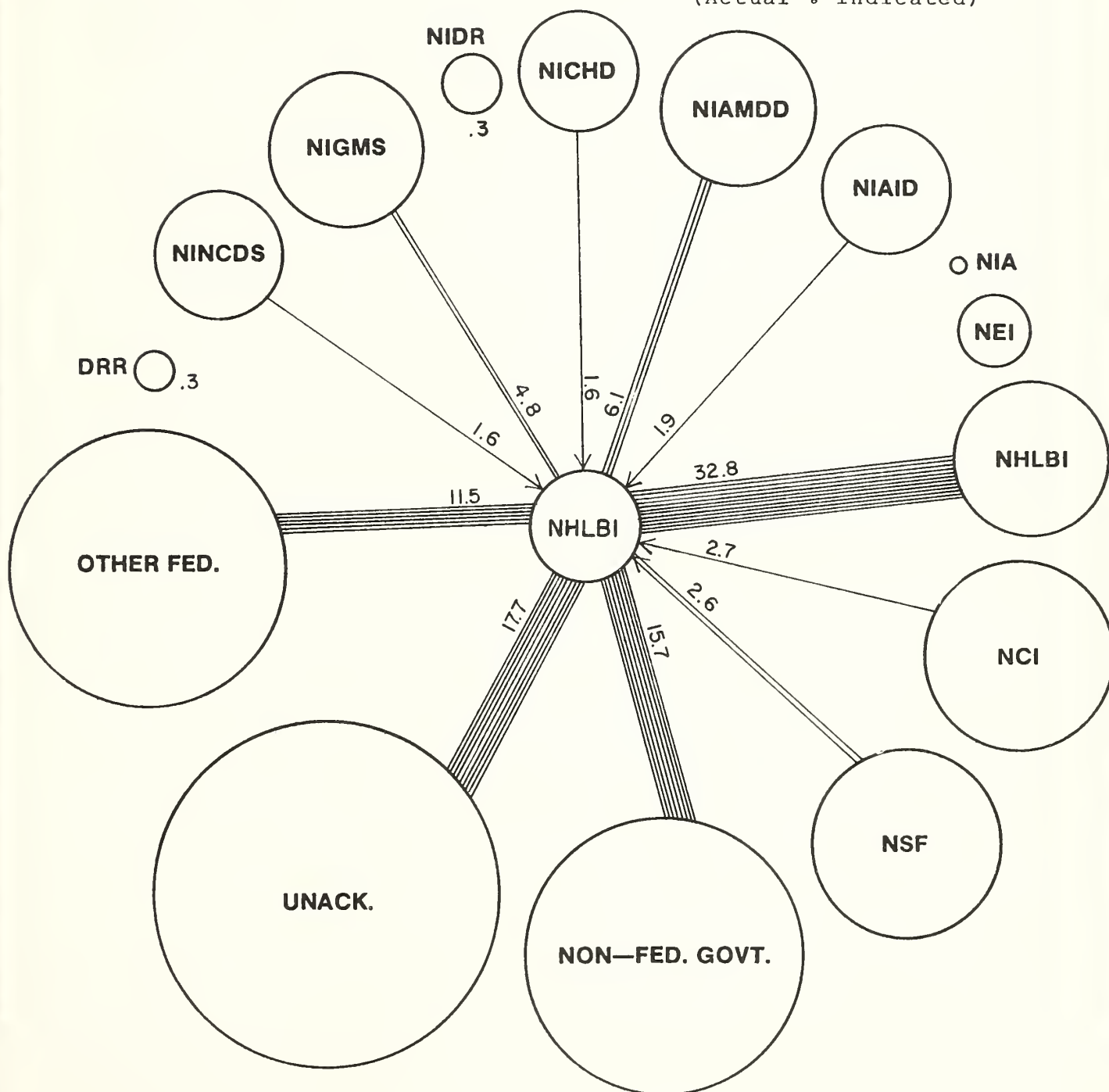


FIGURE 8: CITATIONS RECEIVED BY NHLBI SUPPORTED
PAPERS PUBLISHED IN 1970-1976 FROM U.S.
PAPERS PUBLISHED IN 1973-1977

Note: Size of circle
proportional to #
supported papers -
one arrow for each
2% of citations
(Actual % indicated)



HIGHLY CITED PAPERS

Tables 1 and 2 provide samples of information available about citations to individual papers. Table 1 lists the 10 most highly cited papers in the clinical subfield with which the Institute is most closely identified (usually the highest Activity Index). Table 2 lists the 10 most highly cited papers in the biomedical research subfield for which the Activity Index is highest. These lists are drawn from 1974 publications, and reflect all citations received by 1977. Inasmuch as no Institute has direct responsibility for the basic biomedical research subfields, and an individual Institute's interests may focus on only a single specialty area within one of these broadly defined disciplines, there is no basis on which to expect that any particular Institute will have supported a proportion of the most highly cited papers in a basic science subfield. For the clinical subfields, expectations may be more specific.

Lists of the 25 most highly cited papers supported by each Institute in its fields of concentration, and lists of the 25 most highly cited papers in each subfield and at each research level, for each year 1970 through 1976 are available in the Program Evaluation Branch, OD, NIH (496-4418). Information provided in these lists includes citation frequency rank, the number of citations received in each year, 1973 through 1977, journal identification, author(s), title, level, field and subfield (L/F/S).

TABLE 1: 10 MOST HIGHLY CITED PAPERS FOR SUBFIELD CARDIOVASCULAR SYSTEM
IN 1974: CITING YEARS 1973-77 INCLUSIVE: CITED AND
CITING PAPERS FROM 275 JOURNAL SET

Rank	Total Cites Received	Cites Received by Citing Year				
		77	76	75	74	
1	89	40	34	15	0	"A New Method for Radionuclide Imaging of Acute Myocardial Infarction in Humans" by R. W. Parkey, F. J. Bonte, S. L. Meyer, J. M. Atkins, G. L. Curry, E. M. Stokely, J. T. Willerson CIRCULATION, Vol. 50, Pg. 540 Support Sources: NHLBI, Private Non-profit, American Heart Association Corp. Address: U Texas, Comb. Med.
2	55	11	17	23	4	"The Effects of Cycle Length on Cardiac Refractory Periods in Man" by P. Denes, D. Wu, R. Ohingra, R. J. Pietras, K. M. Rosen CIRCULATION, Vol. 49, Pg. 32 Support Sources: NHLBI, Private Non-profit Corp. Address: U Illinois Med. Ctr., Chicago
3	52	13	27	12	0	"Lipoprotein Uptake and Metabolism by Rat Aortic Smooth Muscle Cells in Tissue Culture" by E. L. Bierman, O. Stein, Y. Stein CIRCUL RES, Vol. 35, Pg. 136 Support Sources: NIAID, NICHD Corp. Address: U Washington Med, Fdn. Chl. Hos. Med.
4	48	15	25	8	0	"The Variable Spectrum of Echocardiographic Manifestations of the Mitral Valve Prolapse Syndrome" by A. N. Demaria, J. F. King, H. G. Bogren, J. E. Lies, D. T. Mason CIRCULATION, Vol. 50, Pg. 33 Support Sources: NHLBI Corp. Address: U California Med, Davis
4	48	19	21	7	1	"Total and Regional Myocardial Blood Flow Measurements with 25 Micron, 15 Micron, 9 Micron, and Filte..." by J. Utley, E. L. Carlson, J. I. Hoffman, H. M. Martinez, G. D. Buckberg CIRCUL RES, Vol. 34, Pg. 391 Support Sources: NHLBI, General Medical Sciences Corp. Address: UCLA Med Sch, U California Med, S. Fran.

TABLE 1: 10 MOST HIGHLY CITED PAPERS FOR SUBFIELD CARDIOVASCULAR SYSTEM
IN 1974: CITING YEARS 1973-77 INCLUSIVE: CITED AND
CITING PAPERS FROM 275 JOURNAL SET (Continued)

Rank	Total Cites Received	Cites Received by Citing Year				
		77	76	75	74	
6	47	16	17	14	0	"Echocardiographic Abnormalities in the Mitral Valve Prolapse Syndrome" by R. L. Popp, O. R. Brown, J. F. Silverman, D. C. Harrison CIRCULATION, Vol. 49, Pg. 428 Support Sources: NHLBI, Private Non-profit Corp. Address: Stanford U Med
7	42	12	16	14	0	"Quantification of Serum Creatine Phosphokinase Isoenzyme Activity" by R. Roberts, P. D. Henry, S. A. Witteveen, B. E. Sobel AM J CARD, Vol. 33, Pg. 650 Support Sources: NHLBI Corp. Address: U Cal Med, S Diego
7	42	12	20	9	1	"Nitroglycerin to Unmask Reversible Asynergy. Correlation with Post Coronary Bypass Ventriculography" by R. H. Helfant, R. Pine, S. G. Meister, M. S. Feldman, R. G. Trout, V. S. Banka CIRCULATION, Vol. 50, Pg. 108 Support Sources: All Unacknowledged/ Unidentified Corp. Address: U Penn Med
9	40	14	11	12	3	"Deleterious Effects Due to Hemorrhage After Myocardial Reperfusion" by G. F. Bresnahan, R. Roberts, W. E. Shell, J. Ross, Jr., B. E. Sobel AM J CARD, Vol. 33, Pg. 82 Support Sources: NHLBI Corp. Address: U California Med, S. Diego
10	38	10	13	10	5	"Consequences of Reperfusion After Coronary Occlusion, Effects on Hemodynamic and Regional Myocardial..." by T. W. Lang, E. Corday, H. Gold, S. Meerbaum, S. Rubins, C. Constantini, S. Hirose, J. Osher, V. Rosen AM J CARD, Vol. 33, Pg. 69 Support Sources: NHLBI Corp. Address: UCLA Med Sch, Cdrs-Sinai Med Ctr

TABLE 2: 10 MOST HIGHLY CITED PAPERS FOR SUBFIELD PHYSIOLOGY
IN 1974: CITING YEARS 1973-77 INCLUSIVE: CITED AND
CITING PAPERS FROM 275 JOURNAL SET

Rank	Total Cites Received	Cites Received by Citing Year				
		77	76	75	74	
1	162	57	60	40	5	"Chemical Nature of Synaptic Transmission in Vertebrates" by K. Krnjevic PHYSIOL REV, Vol. 54, Pg. 418 Support Source: All Unacknowledged/ Unidentified Corp. Address: Fdn Chl Hos Med
2	57	23	19	15	0	"The Sensitivity of Helix Aspersa Neurons to Injected Calcium Ions" by R. W. Meech J PHYSIOL LON, Vol. 237, Pg. 259 Support Source: All Unacknowledged/ Unidentified Corp. Address: Fdn Chl Hos Med
3	55	20	19	13	3	"Ion Transport by Mammalian Small Intestine" by S. G. Schultz, R. A. Frizzell, H. N. Nellans ANN R PHYSIOL, Vol. 36, Pg. 51 Support Source: NIAMD, American Heart Association Corp. Address: U Pittsburgh Med
4	54	20	18	16	0	"Neural Control of the Endocrine Pancreas" by S. C. Woods, D. Porte, Jr. PHYSIOL REV, Vol. 54, Pg. 596 Support Source: NIAMD Corp. Address: U Wash, Seattle; U Wash Med, and other
5	51	10	23	16	2	"Brisk and Sluggish Concentrically Organized Ganglion Cells in the Cat's Retina" by B. G. Cleland; W. R. Levick J PHYSIOL LON, Vol. 24, Pg. 421 Support Source: All Unacknowledged/ Unidentified Corp. Address: Fdn Chl Hos Med
5	51	11	24	15	1	"Kinetics and Steady-State Properties of the Charged System Controlling Sodium Conductance in the Squ..." by R. D. Keynes; E. Rojas J PHYSIOL LON, Vol. 239, Pg. 393 Support Source: Private non-profit Corp. Address: Fdn Chl Hos Med

TABLE 2: 10 MOST HIGHLY CITED PAPERS FOR SUBFIELD PHYSIOLOGY
IN 1974: CITING YEARS 1973-77 INCLUSIVE: CITED AND
CITING PAPERS FROM 275 JOURNAL SET (Continued)

Rank	Total Cites Received	Cites Received by Citing Year				
		77	76	75	74	
7	49	13	20	12	4	"The Effect of Visual Experience on the Development of Stimulus Specificity by Kitten Cortical Neuron..." by J. D. Pettigrew J PHYSL LON, Vol. 237, Pg. 49 Support Source: NEI Corp. Address: U Cal, Berkeley
8	48	12	19	17	0	"Charge Movement Associated with the Opening and Closing of the Activation Gates of the Na Channels" by C. M. Armstrong; F. Bezanilla J GEN PHYSL, Vol. 63, Pg. 533 Support Source: NINCDS Corp. Addresses: U Rochester Med; Fdn Chl Hos Med
8	48	13	23	9	3	"Reversal of the Physiological Effects of Monocular Deprivation in Kittens: Further Evidence for a..." by C. Blakemore; R. C. Van Sluyters J PHYSL LON, Vol. 237, Pg. 195 Support Source: Private Non-profit Corp. Address: Fdn Chl Hos Med
8	48	12	20	13	3	"The Morphological Types of Ganglion Cells of the Domestic Cat's Retina" by B. B. Boycott; H. W. Assle J PHYSL LON, Vol. 240, Pg. 397 Support Source: Private Non-profit Corp. Address: Fdn Chl Hos Med

PUBLICATION PROFILE

Table 3 is a B/I/D publication profile that summarizes bibliometric activity for the Institute for the period 1970-1977. The Table counts all papers published in the B/I/D journal set in the years 1970 through 1976 and counts citations received by these papers from 1973 through 1977.

The first page of the Profile presents the data for all fields combined, for each Research Level and for each of the Major Fields. Page 2 lists the individual subfields of Clinical Medicine and page 3 lists the individual subfields of Biomedical Research. Following are definitions of the column headings:

- 1 Number of Papers - the fractional number of papers supported by this B/I/D in the particular Level, Field and Subfield (L/F/S).
- 2 Activity Index - proportion of the B/I/D's papers in the particular L/F/S divided by the proportion of all papers in the B/I/D journal set in the particular L/F/S.
- 3 % Internal Effort - Percent of the B/I/D's papers in the particular L/F/S.
- 4 % External Effort - Percent of all papers in the B/I/D journal set in the particular L/F/S supported by this B/I/D.
- 5 Total Cites - Total citations (from all journals in B/I/D journal set for citing years 1973 - 1977) received by the papers supported by this B/I/D in the particular L/F/S. Scaled to the average citation rate for each L/F/S in 1972.
- 6 Cites per Paper - Total scaled citations received divided by the number of papers supported.
- 7 Cite T-Score - This BID's citations per paper minus the average citations per paper for all papers in the particular L/F/S, divided by the standard deviation of citations per paper for all papers in the particular L/F/S. The statistic is scaled to a mean of 50 and standard deviation of 10.
- 8 % Papers Among the Top 10% - Percent of this BID's papers in the particular L/F/S that are among the top 10% of the most highly cited of all papers in the particular L/F/S.

Please note that although the publication profile presents analyses for any number of papers, the data are likely to be unstable when based on aggregates of less than about 25. The skewness of citation distributions permits only approximate statements about confidence limits; however, it may be said that to achieve a 95 percent confidence interval of ± 2 citations, a sample size of 20 is required.

BID PUBLICATION PROFILES

HEART, LUNG AND BLOOD INSTITUTE - NHLBI

CITED YEAR : 1970 - 76

BASED ON CITES RECEIVED FROM ALL CITING YEARS 1973-77

CITED AND CITING ARTICLES FROM 293 BID JOURNAL SET

LEVEL/FIELD/SUBFIELD	NUMBER PAPERS	ACTIV INDEX	% INT EFFRT	% EXT EFFRT	TOTAL* CITES	CITES* PER PAPER	CITE T-SCR	% PAPERS AMONG TOP 10%
FIELDS [1-9]	15292.	1.00	100.00	3.06	149207.	9.8	53.39	18.58
CLINICAL-MIX [1-2]	5647.	1.35	36.93	4.14	45692.	8.1	57.32	26.80
CLIN INVESTIGATN [3]	4172.	1.24	27.28	3.79	37656.	9.0	53.94	17.70
BASIC RESEARCH [4]	5472.	0.71	35.78	2.16	66407.	12.1	53.64	19.37
CLIN MEDICINE [1]	9684.	1.43	63.33	4.36	82975.	8.6	54.20	19.29
BIOMED RESEARCH [2]	5048.	1.08	33.01	3.31	64498.	12.8	52.44	14.19
BIOLOGY [3]	196.	0.28	1.28	0.87	1593.	8.1	52.07	21.24
CHEMISTRY [4]	313.	0.16	2.04	0.48	2700.	8.6	56.78	34.72
PHYSICS [5]	18.	0.04	0.12	0.12	99.	5.6	51.88	10.38
EARTH & SPACE SC [6]	0.	0.00	0.00	0.00	0.	0.0	0.00	0.00
ENGRNG & TECHNOL [7]	0.	0.00	0.00	0.00	0.	0.0	0.00	0.00
PSYCHOLOGY [8]	33.	0.05	0.22	0.15	130.	3.9	53.88	18.59
MATHEMATICS [9]	0.	0.00	0.00	0.00	0.	0.0	0.00	0.00

*Scaled to cited year 1972

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BID PUBLICATION PROFILES

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CLIN MEDICINE [1]								
GENRL & INTERNAL MED	2251.	2.20	14.72	6.72	25272.	11.2	55.02	18.29
ALLERGY	24.	1.34	0.15	4.10	229.	9.7	54.31	15.49
ANESTHESIOLOGY	127.	1.68	0.83	5.15	641.	5.1	53.72	20.69
CANCER	55.	0.15	0.36	0.45	428.	7.8	48.85	9.42
CARDIOVASCULAR SYSTM	2578.	9.46	16.86	28.92	27217.	10.6	54.50	16.11
DENTISTRY	7.	0.04	0.05	0.11	21.	3.0	54.25	19.05
DERMAT & VENERL DIS	15.	0.20	0.10	0.62	45.	3.0	50.09	15.56
ENDOCRINOLOGY	213.	0.64	1.39	1.97	2123.	10.0	50.87	11.65
FERTILITY	5.	0.05	0.03	0.16	34.	6.5	54.58	25.81
GASTROENTEROLOGY	33.	0.40	0.21	1.21	289.	8.9	53.72	16.84
GERIATRICS	37.	0.52	0.25	1.58	90.	2.4	56.69	30.22
HEMATOLOGY	453.	3.34	2.96	10.20	3137.	6.9	51.67	15.70
IMMUNOLOGY	273.	0.63	1.79	1.92	2791.	10.2	49.23	9.65
OBSTETRICS & GYNECOL	90.	0.52	0.59	1.58	462.	5.1	52.63	19.59
NEUROL & NEUROSURG	116.	0.19	0.76	0.58	745.	6.4	48.52	4.15
OPHTHALMOLOGY	41.	0.26	0.27	0.81	145.	3.5	49.03	4.05
ORTHOPEDICS	12.	0.12	0.08	0.38	54.	4.6	58.02	24.29
ARTHRITIS & RHEUMAT	7.	0.18	0.04	0.55	51.	7.6	56.77	25.00
OTORHINOLARYNGOLOGY	25.	0.22	0.16	0.66	51.	2.1	51.01	17.69
PATHOLOGY	463.	2.90	3.03	8.88	3123.	6.7	55.48	17.62
PEDIATRICS	217.	0.97	1.42	2.96	1291.	6.0	53.06	15.37
PHARMACOLOGY	561.	1.34	3.67	4.11	5056.	9.0	53.58	17.08
PHARMACY	99.	0.56	0.64	1.72	535.	5.4	55.31	26.57
PSYCHIATRY	23.	0.12	0.15	0.37	124.	5.4	54.65	21.01
RADIOLOGY & NUCL MED	320.	1.13	2.09	3.46	1466.	4.6	52.59	17.53
RESPIRATORY SYSTEM	384.	5.01	2.51	15.33	2066.	5.4	52.22	18.38
SURGERY	1019.	2.10	6.66	6.41	5018.	4.9	53.18	19.16
TROPICAL MEDICINE	9.	0.30	0.06	0.91	27.	3.0	49.19	5.45
UROLOGY	45.	0.39	0.30	1.21	109.	2.4	50.91	15.87
NEPHROLOGY	18.	1.34	0.12	4.10	39.	2.2	51.16	18.69
VETERINARY MEDICINE	82.	0.66	0.54	2.02	176.	2.1	54.09	21.30
ADDICTIVE DISEASES	0.	0.00	0.00	0.00	0.	0.0	0.00	0.00
HYGIENE & PUBL HLTH	83.	0.68	0.54	2.07	466.	5.6	62.66	41.68
MISC CLINICAL MED	0.	0.00	0.00	0.00	0.	0.0	0.00	0.00

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LEVEL/FIELD/SUBFIELD	NUMBER PAPERS	ACTIV INDEX	% INT EFFRT	% EXT EFFRT	TOTAL* CITES	CITES* PER PAPER	CITE T-SCR	% PAPERS AMONG TOP 10%
BIOMED RESEARCH [2]								
PHYSIOLOGY	1495.	4.83	9.78	14.77	13289.	8.9	49.40	10.26
ANATOMY & MORPHOLOGY	47.	1.06	0.31	3.24	158.	3.4	47.25	4.26
EMBRYOLOGY	28.	0.53	0.18	1.63	239.	8.5	52.05	19.05
GENETICS & HEREDITY	37.	0.24	0.24	0.75	185.	5.1	48.96	9.55
NUTRITION & DIETET	94.	1.15	0.62	3.52	496.	5.3	52.26	17.88
BIOCHEM & MOLEC BIOL	2202.	1.10	14.40	3.35	32993.	15.0	52.79	15.77
BIOPHYSICS	86.	2.59	0.56	7.92	574.	6.7	51.43	12.67
CELL BIOL CYT & HIST	235.	0.79	1.53	2.41	3296.	14.1	56.44	20.40
MICROBIOLOGY	28.	0.10	0.18	0.29	278.	10.1	60.45	32.73
VIROLOGY	10.	0.05	0.07	0.16	188.	18.8	57.38	18.33
PARASITOLOGY	4.	0.04	0.03	0.12	7.	1.7	48.71	0.00
BIOMEDICAL ENGINRNG	108.	3.86	0.70	11.79	198.	1.8	51.31	16.41
MICROSCOPY	0.	0.00	0.00	0.00	0.	0.0	0.00	0.00
MISC BIOMEDICAL RES	19.	0.49	0.12	1.51	20.	1.1	49.95	9.65
GENRL BIOMEDICAL RES	658.	0.63	4.30	1.92	13906.	21.1	55.47	18.95

*Scaled to cited year 1972

CROSSCUTTING RESEARCH

Table 4 opens a small window on the breadth of relations between biomedical disciplines and the programmatic interests of NIH. Shown in the table are the clinical medical fields and basic bioscience disciplines that were supported by more than one NIH Institute as reflected in 1970-1977 publications. One hundred papers is the arbitrary minimum number of papers used here to define significant involvement. During this period, only one BID was significantly involved with the production of publications in the following disciplines:

- Respiratory System (NHLBI - 384 papers)
- Tropical Medicine (NIAID - 210 papers)
- Hygiene and Public Health (NIAID - 121 papers)
- Parasitology (NIAID - 709 papers)
- Biomedical Engineering (NHLBI - 108 papers)

The fields and disciplines that have been most widely influenced by NIH programmatic interests (i.e. more than half the Institutes supported a significant number of papers) are:

- General and Internal Medicine
- Endocrinology
- Immunology
- Neurology and Neurosurgery
- Pathology
- Pediatrics
- Pharmacology
- Physiology
- Biochemistry and Molecular Biology

Table 4

Crosscutting Biomedical Subfields
Number of Papers > 100 Acknowledging Support of Each BID
1970-76 Papers in 275 Biomedical Journals

<u>BIDS Subfields</u>	<u>NCI</u>	<u>NEI</u>	<u>NHLBI</u>	<u>NIAMD</u>	<u>NIADDK</u>	<u>NCIHID</u>	<u>NIIDR</u>	<u>NIHMS</u>	<u>NIHNCDS</u>	<u>DRR</u>
Gen. & Int. Medicine	1266	-	2251	1065	2460	551	111	654	315	338
Anesthesiology	-	-	127	-	-	-	-	434	-	-
Cancer	4715	-	-	137	130	-	-	175	-	-
Cardiovascular System	-	-	2578	-	-	-	-	113	-	-
Dermat. & Vb	140	-	-	-	341	-	-	-	-	-
Endocrinology	251	-	213	-	1671	966	-	129	143	162
Hematology	236	-	453	-	224	-	-	-	-	-
Immunology	1161	-	273	2698	660	113	111	275	-	-
Obstetrics & Gynecology	104	-	-	-	-	377	-	-	-	-
Neurology & Neurosurgery	-	480	116	-	-	338	-	342	3651	116
Ophthalmology	-	1589	-	-	-	-	-	-	303	-
Pathology	310	-	463	135	336	-	-	157	113	-
Pediatrics	126	-	217	181	299	592	-	-	142	122
Pharmacology	369	-	561	-	308	136	-	717	492	-
Pharmacy	395	-	-	-	108	-	-	232	102	-
Radiology & Nucl. Medicine	587	-	320	-	-	-	-	427	129	-
Surgery	279	-	1019	-	566	-	-	393	-	-
Urology	105	-	-	-	162	-	-	-	-	-

<u>BIDS Subfields</u>	<u>NCI</u>	<u>NCI</u>	<u>NIHBI</u>	<u>NIAD</u>	<u>NIADDK</u>	<u>NICHID</u>	<u>NIOR</u>	<u>NIGMS</u>	<u>NIHDCS</u>	<u>DRR</u>
Physiology	-	136	1495	-	736	155	-	357	624	-
Anatomy & Morphology	-	-	-	-	-	151	-	-	107	-
Embryology	-	-	-	-	-	282	-	139	-	-
Genetics & Hereditiy	113	-	-	-	-	109	-	612	-	-
Nutrition & Diet	-	-	-	-	372	101	-	-	-	-
Biochem. & Molec. Bio.	2822	141	2202	1193	4869	1153	261	4967	877	253
Cell Biol. Cyto. & Hist.	742	-	235	166	410	337	156	649	253	-
Microbiology	191	-	-	848	203	-	-	699	-	-
Virology	1019	-	-	855	-	-	-	310	-	-

APPENDIX A: LIST OF FORMAL REPORTS AND PAPERS

NIH EVALUATION PROJECT NIH 73-2

Published Papers

1. Narin, Francis, Pinski, Gabriel and Gee, Helen. Structure of the Biomedical Literature. Journal of the American Society for Information Science 27, 1, 25-45, Jan.-Feb. 1976.
2. Frame, J. Davidson, and Narin, Francis. NIH Funding and Biomedical Publication Output. Federation Proceedings, 35, 14, 2529-2532, Dec., 1976.
3. Frame, J. Davidson and Narin, Francis. International Distribution of Biomedical Publications. Federation Proceedings, 36, 6, 1790-1795, May, 1977.
4. Narin, Francis and Shapiro, Rosalie T. The Extramural Role of the NIH as a Research Support Agency. Federation Proceedings, 36, 2470-2475, Nov., 1977.
5. Narin, Francis and Keith, Stephen B. The Intramural Role of the NIH as a Biomedical Research Institute. Federation Proceedings, 37, 2120-2123, June, 1978.

Reports:

6. Evaluation of Linkage Between Research Publications and NIH Funding. Summary of Work. March 73 - June 74. (Prepared by Francis Narin), Sept. 1974.
7. Structure of the Biomedical Literature. (Prepared by Gabriel Pinski), November, 1975.
8. Distribution of International Biomedical Literature. (Prepared by J. Davidson Frame), June 1976.
9. Profiles of Supported Research Publications - For NIH B/I/D's in 1973 and Other Biomedical Research Support Agencies. (Prepared by Rosalie T. Shapiro), September 1976.
10. Cross Institute Integration of Research Supported by NIH. (Prepared by Francis Narin, Rosalie Shapiro and Gabriel Pinski). Delivered at Second Annual Meeting, Society for Social Studies of Science, October, 1977.

11. Multi-dimensional Scaling Models of Subfield and B/I/RD Interactions. (Prepared by Gabriel Pinski), December, 1977.
12. Bibliometric Characterization of Research Papers from U.S. Medical Schools. (Prepared by Paul McAllister and Francis Narin), Delivered at Third Annual Meeting, Society for Social Studies of Science, Nov. 1978. Being updated for journal submission.
13. Trends in NIH Funding and the Production of Biomedical Papers. (Prepared by J. Davidson Frame, Francis Narin and Helen H. Gee), March, 1980. (To be submitted for Journal publication.)
14. Bibliometric Characterization of Transient and Resident Scientists in a Specialty Area. (Manuscript in preparation by Francis Narin and D. Wagner)

Related Documents

15. Narin, Francis. Evaluative Bibliometrics: The Use of Publication and Citation Analysis in the Evaluation of Scientific Activity. National Science Foundation. March, 1976. Monograph: 456 pp. NTIS Accession #PB252339/AS.
16. Pinski, Gabriel and Narin, Francis. Citation Influence for Journal Aggregates of Scientific Publications: Theory, With Application to the Literature of Physics. Information Processing and Management 12(5), 297-312, 1976.
17. Science Citation Index. Copyright Institute for Scientific Information.
18. Science Indicators. 1972, 1974, 1976, 1978. Reports of the National Science Board, Washington, D.C.: Government Printing Office, 1973, 1975, 1977, 1979.

APPENDIX B: LISTING OF THE B/I/D JOURNAL SET BY SUBFIELD

GENRL & INTERNAL MED

AM J MED (L2)
 AM J MED SC (L2)
 ANN INT MED (L1)
 ARCH IN MED (L2)
 BIOCHEM MED (L3)
 CLIN CHEM (L3)
 CLIN CHIM A (L3)
 CLIN SC MOL (L3)
 J AM MED A (L1)
 J CHRON DIS (L1)
 J CLIN INV (L3)
 J LA CL MED (L3)
 LANCET (L2)
 MEDICINE (L2)
 N ENG J MED (L2)
 P SOC EXP M (L3)
 SOUTH MED J (L1)
 YALE J BIOL (L3)

ALLERGY

J ALLERG CL (L2)

ANESTHESIOLOGY

ANESTH ANAL (L2)
 ANESTHESIOLOG (L2)

CANCER

CANC CHEMOT (L3)
 CANCER (L2)
 CANCER RES (L3)
 INT J CANC (L3)
 J NAT CANC (L3)
 ONCOLOGY (L2)

DENTISTRY

AM J ORTHOD (L2)
 ARCH ORAL B (L3)
 J AM DENT A (L1)
 J DENT RES (L3)
 J PERIODONT (L2)
 ORAL SURG O (L2)
 PERIODONTIC

DERMAT & VENERL DIS

ARCH DERMAT (L2)
 J INVES DER (L3)

ENDOCRINOLOGY

DIABETES (L3)
 ENDOCRINOL (L3)
 GEN C ENDOC (L4)
 J CLIN END (L3)
 J ENDOCR (L3)
 METABOLISM (L3)
 NEUROENDOCR (L3)

FERTILITY

FERT STERIL (L2)
 J REPR FERT (L3)

GASTROENTEROLOGY

AM J DIG DI (L2)
 GASTROENTY (L2)

GERIATRICS

GERIATRICS (L1)
 GERONTOL (L1)
 J AM GER SO (L1)
 J GERONTOL (L2)

CARDIOVASCULAR SYSTM

AM HEART J (L2)
AM J CARD (L2)
CHEST (L1)
CIRCUL RES (L3)
CIRCULATION (L2)

IMMUNOLOGY

CLIN EXP IM (L2)
IMMUNOCHEM (L3)
IMMUNOLOGY (L3)
J EXP MED (L3)
J IMMUNOL (L3)
J INFEC DIS (L2)
J RETIC SOC (L3)
TRANSPLAN P (L3)
TRANSPLANT (L3)

OBSTETRICS & GYNECOL

AM J OBST G (L2)
OBSTET GYN (L1)

NEUROL & NEUROSURG

ARCH NE PSY (L1)
ARCH NEUROL (L2)
BRAIN RES (L4)
DEVELOP MED (L2)
EEG CL NEUR (L3)
EPILEPSIA (L2)
EXP BRAIN R (L4)
EXP NEUROL (L4)
J COMP NEUR (L4)
J NE EXP NE (L3)
J NE NE PSY (L2)
J NEUROCHEM (L4)
J NEUROSURG (L1)
J NEURPHYSL (L4)
NEUROLOGY (L2)
VISION RES (L4)

OPHTHALMOLOGY

AM J OPHTH (L2)
ARCH OPHTH (L2)
EXP EYE RES (L3)
INV OPHTH V (L3)

HEMATOLOGY

BLOOD (L3)
BR J HAEM (L3)
THROMB DIAT (L3)
VOX SANGUIN (L3)

ARTHRITIS & RHEUMAT

ANN RHEUM D (L2)
ARTH RHEUM (L2)

OTORHINOLARYNGOLOGY

ANN OTOL RH (L2)
ARCH OTOLAR (L1)
J SPEECH HE (L2)
LARYNGOSCOP (L1)

PATHOLOGY

AM J CLIN P (L2)
AM J PATH (L3)
ARCH PATH (L2)
EXP MOL PAT (L3)
LAB INV (L3)

PEDIATRICS

AM J DIS CH (L2)
BIOL NEONAT (L3)
J PEDIAT (L2)
PEDIAT RES (L3)
PEDIATRICS (L2)

PHARMACOLOGY

BIOCH PHARM (L3)
CLIN PHARM (L2)
CURR THER R (L1)
EUR J PHARM (L3)
J CLIN PHAR (L1)
J PHARM EXP (L3)
MOLEC PHARM (L3)
NEUROPHARM (L3)
PHARM REV (L3)
PSYCHOPHARM (L3)
TOX APPL PH (L3)

ORTHOPEDICS

CLIN ORTHOP (L2)
J BONE JOIN (L1)
J BONE - AM V (L1)

PSYCHIATRY

AM J ORTHOP (L1)
AM J PSYCHI (L1)
ARCH G PSYC (L1)
ARCH NE PSY (L1)
BR J PSYCHI (L1)
DIS NER SYS (L1)
J NERV MENT (L1)
J PSYCH RES (L2)
PSYCHOS MED (L2)

RADIOLOGY & NUCL MED

AM J ROENTG (L1)
INV RADIOL (L2)
J NUCL MED (L2)
RADIAT RES (L4)
RADIOLOGY (L2)
SEM ROENTG (L1)

RESPIRATORY SYSTEM

AM R RESP D (L2)
CHEST (L1)
RESP PHYSL (L4)

SURGERY

AM J SURG (L1)
ANN SURG (L1)
ARCH SURG (L1)
J PED SURG (L1)
J SURG RES (L2)
J THOR SURG (L1)
J TRAUMA (L1)
PLAS R SURG (L1)
SURG GYN OB (L1)
SURGERY (L1)
T AM S ART (L1)

TROPICAL MEDICINE

AM J TROP M (L2)

PHARMACY

J MED CHEM (L3)
J PHARM SCI (L3)

NEPHROLOGY

NEPHRON (L2)

VETERINARY MEDICINE

AM J VET RE (L3)
J AM VET ME (L2)

HYGIENE & PUBL HLTH

AM J EPIDEM (L2)
AM J PUB HE (L1)
ARCH ENV HE (L2)
B WHO (L2)

PHYSIOLOGY

AM J PHYSL (L4)
ANN R PHYSL (L4)
J APP PHYSL (L4)
J GEN PHYSL (L4)
J PHYSL LON (L4)
LIFE SCI P1 (L4)
PHYSIOL REV (L4)

ANATOMY & MORPHOLOGY

AM J ANAT (L4)
ANAT REC (L4)

EMBRYOLOGY

DEVELOP BIO (L4)
TERATOLOGY (L4)

GENETICS & HEREDITY

AM J HU GEN (L3)
ANN HUM GEN (L3)
BIOCHEM GEN (L4)
CHROMOSOMA (L4)
GENETICS (L4)
MUTAT RES (L4)

UROLOGY

INV UROL (L2)
J UROL (L1)

BIOCHEM & MOLEC BIOL

ANALYT BIOC (L4)
ANN R BIOCH (L4)
ARCH BIOCH (L4)
BIOC BIOP A (L4)
BIOC BIOP R (L4)
BIOCHEM (L4)
BIOCHEM J (L4)
BIOPOLYMERS (L4)
COLD S HARB (L4)
EUR J BIOCH (L4)
FEBS LETTER (L4)
J BIOL CHEM (L4)
J LIPID RES (L4)
J MOL BIOL (L4)
J THEOR BIO (L4)
LIFE SCI P2 (L4)
LIPIDS (L4)
STEROIDS (L4)

BIOPHYSICS

ANN R BIOPH (L4)
BIOPHYS J (L4)
J BIOMECHAN (L4)

CELL BIOL CYT & HIST

ACT CYTOL (L2)
CALCIF TISS (L3)
EXP CELL RE (L4)
J CELL BIOL (L4)
J CELL PHYS (L4)
J HIST CYTO (L4)
J MEMBR BIO (L4)
J ULTRA RES (L4)
STAIN TECH (L4)

MICROBIOLOGY

ANN R MICRO (L4)
APPL MICROB (L4)
J BACT (L4)
J GEN MICRO (L4)

NUTRITION & DIETET

AM J CLIN N (L4)
J NUTR (L4)

PARASITOLOGY

EXP PARASIT (L4)
J PARASITOL (L4)
J PROTOZOO (L4)

BIOMEDICAL ENGINEERING

COMPUT BIOM (L3)
IEEE BIOMED (L3)

MISC BIOMEDICAL RES

HUMAN BIOL (L3)
LAB ANIM SC (L3)

GENRL BIOMEDICAL RES

ANN NY ACAD (L4)
EXPERIENTIA (L4)
FED PROC (L4)
LIFE SCI (L4)
NATURE (L4)
P NAS US (L4)
SCIENCE (L4)

GENERAL BIOLOGY

ANN NY ACAD (L4)
EXPERIENTIA (L4)
NATURE (L4)
P NAS US (L4)
SCIENCE (L4)

GENERAL ZOOLOGY

AM ZOOLOG (L4)
J EXP ZOOL (L4)

VIROLOGY

J GEN VIROL (L4)
J VIROLOGY (L4)
VIROLOGY (L4)

BOTANY

PHYTOCHEM (L4)
PLANT PHYSL (L4)

AGRICULT & FOOD SCI

J AGR FOOD (L3)

DAIRY & ANIMAL SCI

J ANIM SCI (L3)
J DAIRY SCI (L3)

MISCELLANEOUS BIOL

AM J P ANTH (L4)

ANALYTICAL CHEMISTRY

ANALYT CHEM (L3)
J CHROMAT (L3)

ORGANIC CHEMISTRY

CARBOHY RES (L4)
J CHEM S (L4)
J HETERO CH (L4)
J ORG CHEM (L4)
TETRAHEDR L (L4)

ENTOMOLOGY

J MED ENT (L3)

MISCELLANEOUS ZOOL

COMP BIOCH (L4)

POLYMERS

J POL SC PP (L3)

PHYSICAL CHEMISTRY

ACT CRYST (L4)
J CHEM S (L4)
J PHYS CHEM (L4)

CHEMICAL PHYSICS

J CHEM PHYS (L4)
J CHEM S (L4)

ACOUSTICS

J ACOUST SO (L3)

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